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A Brief Summary of the Status of Susitna River Sockeye Salmon

by

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BACKGROUND

There has recently been considerable interest in the present status of sockeye salmon stocks utilizing the Susitna River drainage. As indicated by statements coming from diverse sources, a great deal of confusion exists regarding past, present and future status of these stocks, development of the present escapement goal for the system, and management problems encountered in managing the Cook Inlet commercial salmon fishery to achieve the best possible escapements in a number of important river systems. This summary is intended to briefly review these areas and alleviate as much of the current confusion as possible.

Development of the Escapement Goal

Side-scanning sonar equipment to count adult salmon was first used in the mainstem of the Susitna River in 1978. Concurrently, the Cook Inlet Regional Planning Team made subjective estimates of potential productivity of the Susitna River drainage, and suggested the system should be capable of supporting a run of 800,000 sockeye salmon. The department, assuming an average return per spawner of 4 to 1, established an initial *optimum* escapement goal of 200,000 sockeye salmon but did not have sufficient information to set a range around this goal. This optimum point goal remained in place until changes in river configuration made it impossible to continue counting operations in 1986. Fortunately, a sonar site on the Yentna River had been used by Su-Hydro investigators since 1981 so a five-year data base was available to estimate the percentage of the total escapement which entered the Yentna River.

	Yentna	Susitna	% Yentna
1981	139,401	340,232	41.0 %
1982	113,847	265,332	42.9 %
1983	104,414	175,936	59.3 %
1984	149,375	279,446	53.5 %
1985	107,124	227,924	47.0 %
		Average	48.7 %

Total Susitna River drainage escapement for the above years was estimated by adding Yentna River sonar counts to Sunshine Station mark-recapture estimates for all years except 1981, when the Susitna Station sonar estimate was used. Given these results, the department set a Yentna River escapement goal of 100,000 to 150,000 (Figure 1). This range was intended as an *optimum goal*, to ensure that the total system goal of 200,000 was reached even if the Yentna River accounted for as much as 75% of the total escapement in some years. The range was not chosen to define acceptable upper and lower limits to total system production as has been done for systems such as the Kenai and Crescent rivers. Unfortunately, staff members have frequently referred to the defined values as minimum and maximum goals which has resulted in many people equating the range established

for the Yentna with the more rigorously defined goals in the Kenai River. The Yentna goal must be viewed as a roughly defined, conservative starting point that will likely be redefined as more data concerning spawner/recruit relationships becomes available.

The Susitna River sockeye salmon stocks cannot and should not be viewed as depressed. Likely brood year production based on stock identification analysis using scale growth (or average proportional contribution to catches for years when stock identification results were not available) and age composition data clearly indicates that Susitna production improved beginning in the late 1970's and has remained fairly stable since that time (Figure 2). It is also useful to examine escapement trends in the Susitna River from the same viewpoint utilized to evaluate escapement in the Kenai River. Estimating Susitna escapement by doubling the estimated count in the Yentna River (supported by the above data indicating an average Yentna proportion of just under 50%), applying the 200,000 fish optimum goal and adding the same percentage deviation from the optimum as is used in the Kenai River, again shows no pattern of steadily poorer escapement (Figure 3).

A better understanding of the terms minimum and maximum needs to be conveyed to the public. Escapement goals ensure a level of sustained yield and guide the management of the fishery by providing rationale for various management actions. Short-term deviations from the goal or range generally have only a minor impact on any system's long-term productivity. No biologic cataclysm occurs when escapement falls slightly short of a minimum goal or slightly exceeds a maximum goal. The department's ability to meet escapement goals must be placed in the proper perspective.

Several years ago, extensive efforts were made to measure the amount of available rearing habitat for juvenile sockeye salmon in the Susitna River drainage by computing the cumulative euphotic volume of its many nursery lakes. Results suggested that based on euphotic volume alone, the drainage should be capable of producing approximately 1,000,000 adult sockeye salmon on an annual basis. However, nearly 400,000 of these fish were attributed to Chelatna Lake, which more recent studies indicate is much less productive. Actual expected adult potential, therefore, is probably closer to 600,000 to 800,000 sockeye salmon annually, a value equal to the estimated production for recent years.

In summary, there is no evidence to suggest that the 200,000 sockeye salmon escapement goal for the Susitna River is improper, and recent escapement levels appear to have been largely successful in fully optimizing adult returns to the system.

Management of the Commercial Fishery

Development of side-scan sonar devices for enumeration of returning adult salmon to Cook Inlet's glacial rivers, combined with a limited ability to apportion commercial catches to river of origin, made it possible to establish escapement goals for individual systems and develop management strategies designed to

achieve these goals. Sonar was first used for the Kenai and Kasilof Rivers in 1968, the Susitna River in 1978 and the Crescent River in 1979. It must also be realized that establishing goals and achieving goals are two separate issues. Initial establishment of goals for the Kenai and Kasilof posed no insurmountable obstacles as goals were modest and stocks were sufficiently separated in time and area to allow a fairly straightforward management approach. At first, Cook Inlet sockeye runs, generally dominated by the Kenai River run, were simply managed to attempt to meet escapement objectives in the Kenai. Even with this simple approach, escapement goals were either not achieved or exceeded fairly regularly. Escapement in the Kenai has been outside the desired range in 17 of 23 years (Figure 4). Lack of precision can largely be attributed to difficulty in determining run strength inseason and fisheries structured in ways that precluded tight control over entry patterns into the river.

This situation changed significantly in 1978 with the use of sonar in the Susitna River and establishment of an escapement goal for this system. Setting a goal generally implies having sufficient knowledge or tools to enable achievement of that goal. For the Susitna, as for the Kenai, the goal was established first and the methodology for achieving it was developed later. Initial escapements were well below the goal but improved steadily until the early 1980's when an unexpected and unprecedented upsurge in production of sockeye salmon from the Kenai River began in the early 1980's. Since movement of sockeye salmon through the Central District to both the Kenai and Susitna occur nearly simultaneously, managers were faced with the dilemma of attempting to fully exploit abnormally large Kenai River surpluses without overexploiting Susitna returns of normal strength. A wide variety of boundary lines have been used over the last 12 years to exploit any differences that were thought to exist in timing or migration routes of these two stocks (Figure 5). Out of this experimentation came the "corridor", a three-mile wide band of water along the east side beach. For drift gillnetters, the corridor is effectively only 1 1/2 miles wide as set nets fill the inshore 1 1/2 miles. This area appears to provide a relatively stock-specific harvest of Kenai and Kasilof fish with only a very small Susitna component. The full corridor is utilized only when escapement is adequate in both the Kasilof and Kenai Rivers. Otherwise, the northern portion can be closed to protect the Kenai run or the southern portion closed to protect the Kasilof run.

Currently, the corridor is generally used either to allow the drift fleet additional fishing time to harvest surplus Kenai or Kasilof River sockeye or to restrict drift fleet fishing area during regular periods to assist in moving Susitna sockeye through the district. A major drawback of using the corridor is that it is only effective for harvesting substantial numbers of Kenai-bound sockeye for a brief period of time after mid July. As such, it is useful when the numbers of surplus fish are moderate, but woefully inadequate when large surpluses, which frequently occurred during the late 1980's and early 1990's, were present. Another drawback to use of the corridor is the provision of the Kenai River Chinook Salmon Management Plan which prohibits additional fishing time for the drift fleet in the corridor, as well as for east side set nets, if the projected escapement of chinook salmon falls below a given level. This makes it unwise to depend too heavily on a tool which may not be available at the time it is most needed.

There have been informal discussions of locking the drift fleet in the corridor on a full-time basis either as a way of assuring adequate escapement for Susitna or as a tool the Board of Fisheries could adopt to allocate all or some portion of the Susitna return to Northern District setnetters. Several factors must be considered with such an approach:

1. It cannot be justified purely on a biological basis to restore the Susitna. As discussed above, no dire situation exists in the Susitna that calls for such drastic action since even the poorest escapements measured have produced substantial harvestable surpluses. To eliminate the drift harvest entirely could only be viewed as allocative.

2. Evaluation of overall run-strength of sockeye salmon currently depends on periodic district-wide drift openings. This is the only measure of abundance the department has during the period when major management decisions are made.

3. Large returns of Kenai River sockeye would be severely underharvested if the drift fleet was relegated entirely to the corridor. Large numbers of Kenai-bound fish are not present in the corridor until they begin rapidly moving to the river. Their availability for harvest would be greatly compressed in time and the effectiveness of the fleet would decline drastically. Currently, large drift catches during the first half of the season are followed by large east side set net catches and moderate drift catches in the corridor. This temporal harvest pattern allows processors sufficient time to deal with large harvests. Forcing most of the season's catch into an 8-10 day time frame would lead to major processing bottlenecks and an inferior product.

4. The reduced time frame offered by extensive use of the corridor makes the fishery much more dependant on weather. Drift gillnetting is severely hampered when winds exceed 25 knots, which is not an uncommon occurrence in Cook Inlet. While a period missed due to weather in the current fishery can generally be compensated for by additional fishing time, a "last stand on the beach" approach would be disastrous if major movement of fish coincided with bad weather.

5. Issues beyond the currently high-profile Susitna/Kenai sockeye controversy need to be considered. A strategy that relies heavily or exclusively on drift harvest in the corridor virtually guarantees the need for round-the-clock fishing in the corridor, as well as in the east side set net fishery, beginning in early July and continuing into early August in order to deal with Kasilof surpluses as well as surpluses from even modest Kenai River returns. Such a strategy will not be viewed favorably by recreational fishermen since it can impact Kenai River chinook and coho.

6. As mentioned above, the chinook salmon management plan prohibits use of both the corridor and east side set nets, if chinook spawning escapement projections fall below given levels. Accurate

projections are generally not available until July 15-20, leaving the manager with too much uncertainty concerning the tools he will have available until it is too late to take effective action out in the district.

Given that the outlook for at least the next three years is for commercial harvests to remain below 3 million and for surpluses bound for Kenai to be small or nonexistent, there is no reason to believe that the severe escapement shortfalls which occurred in the Susitna in 1987,1988 and 1992 or the severe surpluses which occurred in the Kenai in the same years will be repeated. While management accuracy remains sufficiently imprecise to guarantee that desired escapement levels will be achieved, the wide departure from escapement goals which has caused so much controversy are not likely to be repeated.

Anticipated Management Actions for 1993

Looking ahead specifically to the 1993 season, the following factors must be considered in choosing the department's management options. The forecast run of sockeye to the Kenai River is slightly less than 2 million, the smallest forecasted run in many years. After removing escapement needs and accounting for recreational and personal use harvest downstream of the sonar counters, approximately 1.3 million fish will be left to harvest in the commercial fishery at an exploitation rate of 65%. The Kasilof run is forecasted to be 991,000 which will allow an exploitation rate of about 80%. The Susitna run is forecast to be 452,000 which will allow an exploitation of about 50%. The overall exploitation rate needed to allow escapement goals in all systems will be among the lowest in recent years and the disparity between Kenai and Susitna exploitation rates is considerably smaller than average.

Based on these factors and the experience gained from dealing with these stocks over the past decade, appropriate management actions can be grouped in two phases: restrictions imposed on the drift gillnet fishery prior to gaining inseason knowledge of Susitna River run strength and further restrictions that may be required after run strength can be measured more accurately during the season:

1. The standard fishing period schedule for drift gillnetting in Upper Cook Inlet allows for two 12-hour weekly fishing periods beginning in late June. Fish harvested in the drift fishery and lower east side set net fishery through early July are predominately bound for the Kasilof River so these periods should proceed as scheduled. Additional time may be required in the lower east side set net fishery and the southern portion of the 3-mile drift corridor to deal with surges in Kasilof escapement.

2. The three drift fishing periods scheduled for July 9, 12 and 16 are likely to produce mixed catches of all three major stocks with peak catches occurring near mid-month. Major restriction of the

drift fishery, i.e. corridor fishing, for two of these periods should provide most if not all of the needed reduction in Susitna harvest. One of these periods should not be restricted to allow for determination of overall run-strength and specifically to determine if the Kenai return is developing as expected. The period that would best supply this information is on July 12. The July 9 and 16 period would be restricted to a corridor fishery unless Kenai run-strength was found to be much higher than anticipated.

3. Fishing in the Northern District would initially adhere to the standard schedule to gain information on Susitna run strength. When Susitna sockeye begin moving through the Northern District in force (likely at some point after July 15) catches will provide the first indication of Susitna abundance. If necessary at that point, further Northern District set net periods can be restricted and the drift fleet can be confined to the corridor until escapement needs have been met or the run effectively ends.

4. Kenai and Kasilof surpluses resulting from this fishing pattern will be dealt with in the east side set net fishery and corridor drift fishery. Should an unexpected weakness in the Kenai chinook return preclude use of the corridor, it may be necessary to consider a more offshore-oriented corridor similar to the one used in 1992 (i.e. one extending from three out to eight miles offshore).

YENTNA RIVER
SOCKEYE SALMON ESCAPEMENT

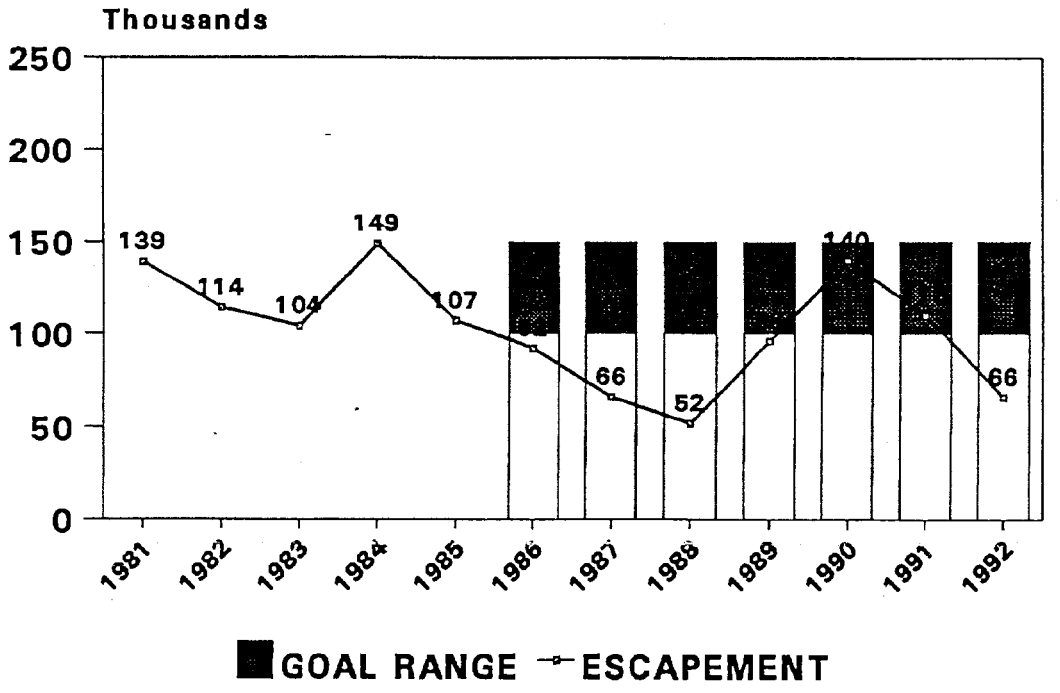

FIGURE 1.

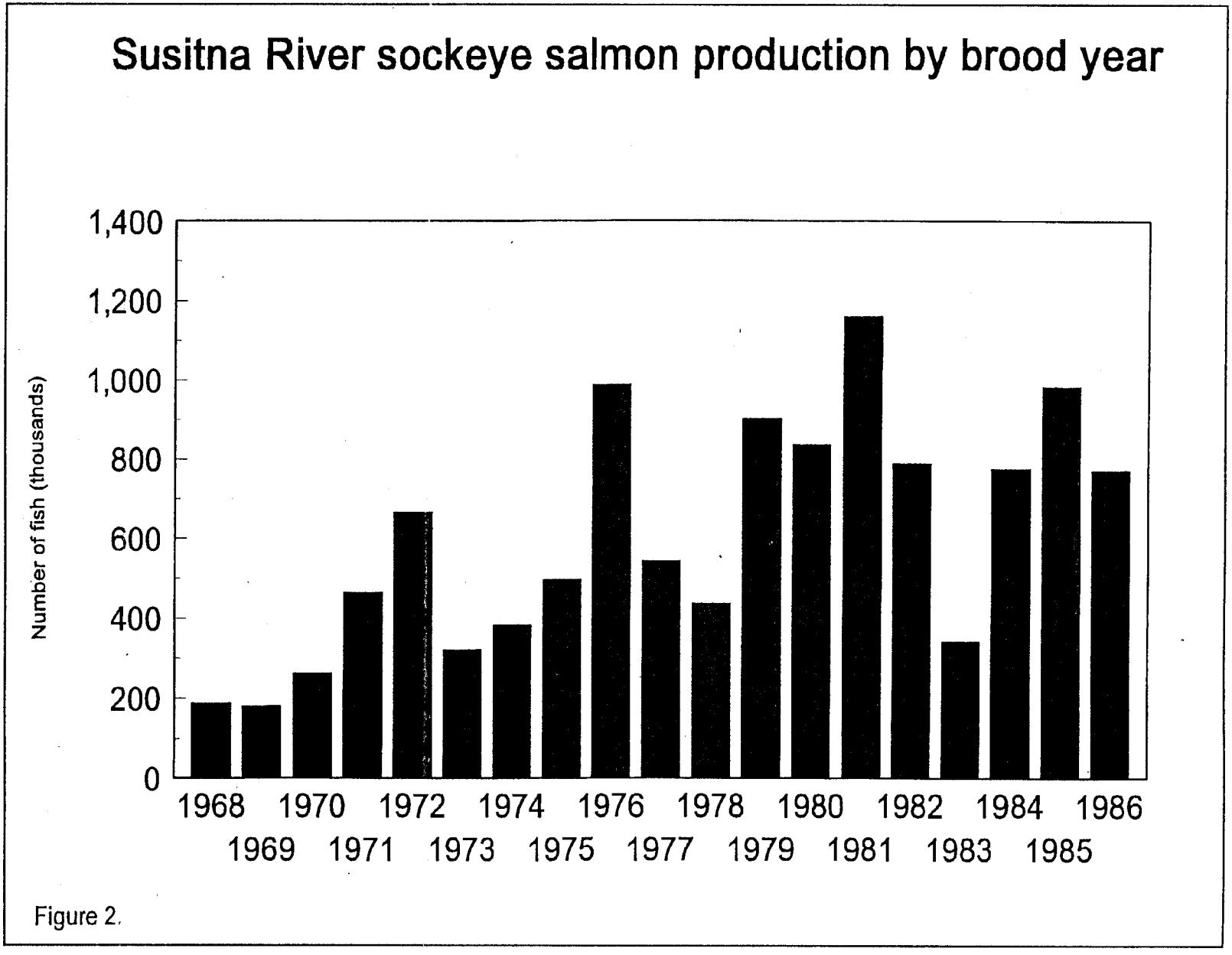
Susitna River sockeye salmon production by brood year
Number of fish (thousands)
1,400
1,200
1,000
800
600
400
200
0
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986

Figure 2.

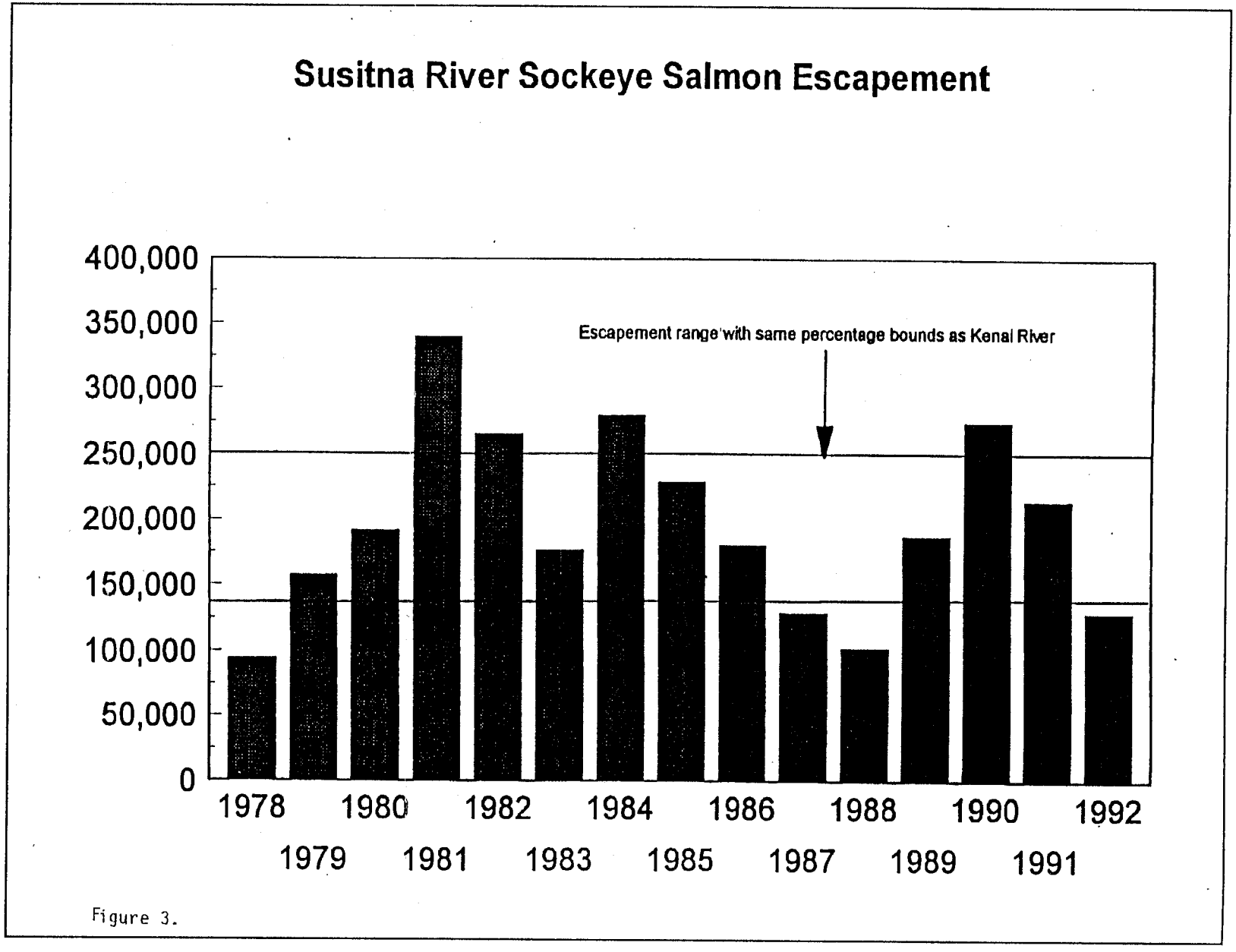
Susitna River Sockeye Salmon Escapement
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Escapement range with same percentage bounds as Kenai River
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992

Figure 3.

KENAI RIVER
SOCKEYE SALMON ESCAPEMENT

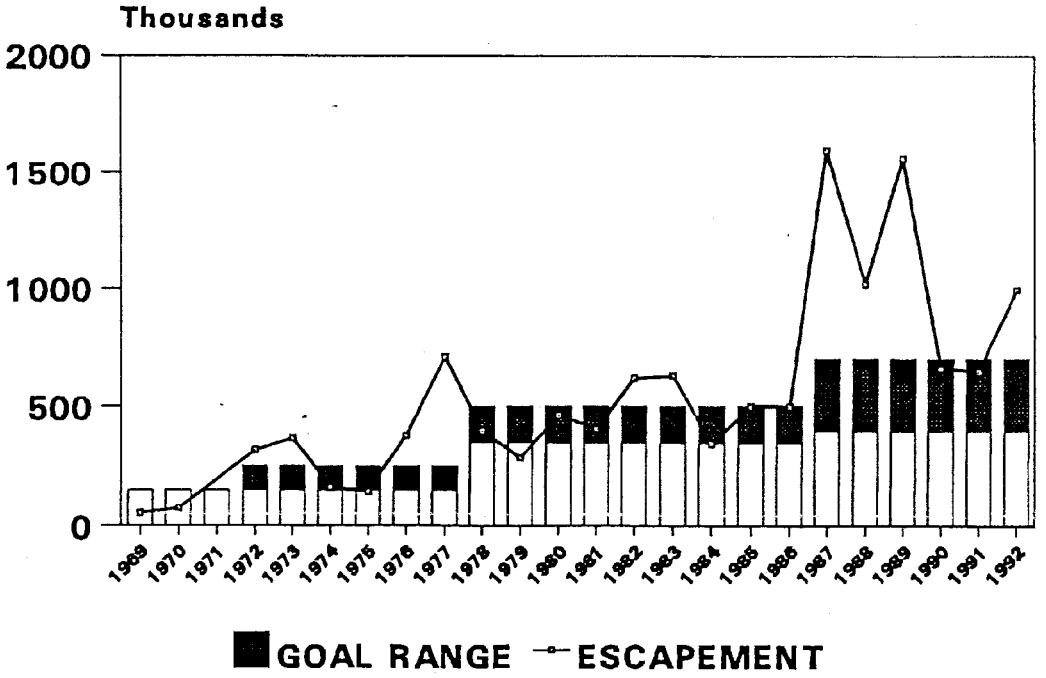

FIGURE 4.

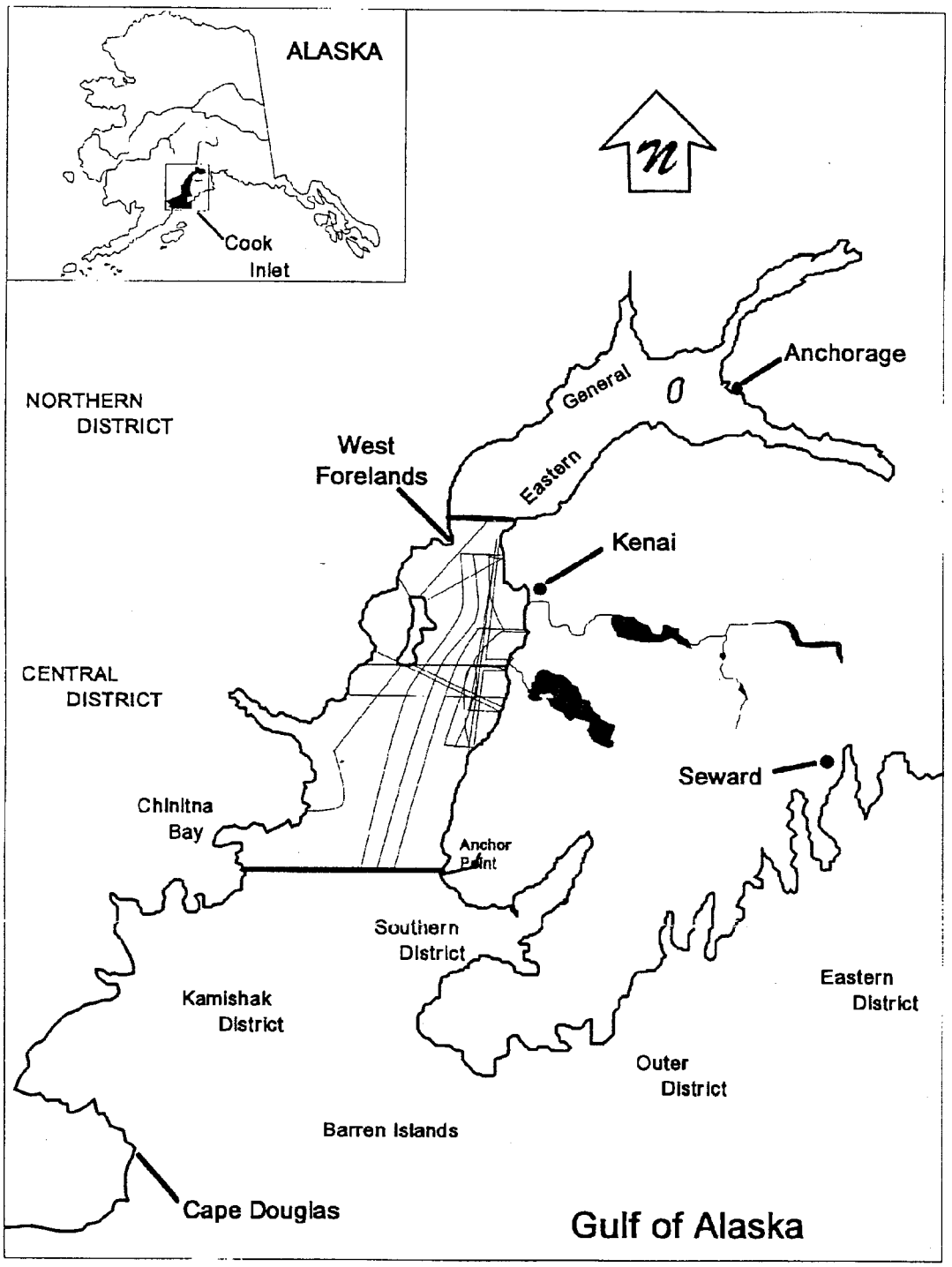

Figure 5. Lines used to restrict the drift fleet since 1980..